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AND OF
THE INSTITUTIONS IN UNION.

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Announcements by the Council.

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Ordinary Meetings.

Wednesday Evenings at 8 o'clock.

Dec. 14.—"On the Recent Progress and Present State of Industry in Ireland; and the Dublin International Exhibition of 1865." By Sir Robert Kane, F.R.S. On this occasion Lord Dufferin will preside.

Dec. 21.—The Articles sent in Competition for the Art-Workmanship Prizes will be Exhibited, and a Report in connection therewith will be read.

Cantor Lectures.

"On the Reproduction of Natural Forms by Art and Manufacture." By B. Waterhouse Hawkins, Esq., F.G.S., F.L.S.

Dec. 12th.—Lecture I.—Introductory:—On the nature and probable influence of museums of natural history and art collections, and their effect on the public mind and taste. (Illustrated.)

Dec. 19.—Lecture II.—Demonstrations of the unity of plan in the external forms of animals, the just appreciation of which facilitates the work of the artistic producer, and adds to the enjoyment of the intelligent possessor of works of art.

Jan. 16th, 1865.—Lecture III.—On the varieties of artistic treatment of the forms of animal and vegetable life—pictorial representation; conventional ornamental, allegorical, and symbolic combinations of animal forms.

Jan. 23rd.—Lecture IV.—On the fitness of designs, and their adaptation to the conditions of the materials in which they are to be produced. (Demonstrated by metal-work processes, sand-moulding, casting, and chasing).

Jan. 30th.—Lecture V.—On Ceramic Manufactures, with the Influence of the material on the design and its successful production—modern Terra Cotta, Della Robbia ware, Majolica, and Parian.

These Lectures are open to Members free of charge, and a Member has the privilege of introducing ONE Friend to each Lecture. A set of tickets for this purpose has been sent to every member.

Art-Workmanship Prizes.

Articles (ninety-six in number) sent in competition for the Art-Workmanship Prizes, have been received from seventy-three competitors, and will be arranged for exhibition in the Society's rooms on and after Wednesday, the 21st instant.

Stettin General Exhibition of Industry.

The Board of Trade have sent to the Council the following information from H.M. Consul at Stettin, in reference to this Exhibition:—

The exhibition is under the patronage of H.R.H. the Crown Prince of Prussia, and will open, simultaneously with the exhibition of agricultural products, in May, 1865. The following committee, consisting of Messrs. Dr. Delbrück, Director of Cement works; Hobrecht, City Architect; G. Müller, Belgian Consul; R. Müller, Director of Sugar-works; Th. von der Nahmer, bookseller; Rahm, Councillor of Commerce, President of the Chamber of Commerce; Dr. Scheibler, chemist; Stein, Director of the Berlin Stettin Railway, appointed by the Polytechnic Society of Stettin, has been entrusted with the management of the exhibition and has issued the following conditions:—1. Exhibitors of all nations and products of all countries are admitted. The committee is, however, authorised to refuse articles of inferior quality or minor importance. 2. The exhibition will be opened on the 15th of May and closed at the end of June. 3. The exhibitors are requested to forward a specification of the articles which they intend to exhibit, as well as of the space required for them, to the undersigned committee before the 1st of January, 1865. 4. In order to defray part of the expenses a charge will be made, the amount of which will be calculated according to the value of, and the space occupied by, the exhibited article. In respect to space, the charge per square foot, either of the floor or walls in the building itself, will be 2½ sgr.* In respect to value, for articles under 49 dollars, a charge of 10 sgr.;

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* 10 sgr. equal to 1 shilling. 1 dollar equal to 3 shillings.

for articles from 50 to 149 dollars inclusive, 20 sgr.; for articles from 150 dollars and upwards, ½ per cent. of the value. Articles of considerable size, as machines, carriages, &c., which will be exhibited in the side-wings, pay but one-half of the above mentioned charge. For instance, for an article worth 25 dollars and occupying 6 square feet, 25 sgr. will be charged, viz., 10 sgr. value and 15 sgr. space. The charge for an article worth 300 dollars and occupying 16 square feet, would be 2 dollars, 25 sgr., viz., 1 dollar 15 sgr. value, and 1 dollar 10 sgr. space. For machines worth 2,000 dollars and occupying 80 square feet, which will be exhibited in the side-wings of the building, the charge would be 8 dollars 10 sgr., viz., 5 dollars value and 3 dollars and 10 sgr. space. (For every fraction of a hundred the full per-centage will be reckoned. Every exhibitor will only have to pay the charge on the sum total of the value of all the articles exhibited by him.) 5. As commission-agents for receiving, unpacking and repacking goods, and for acting as representatives of exhibitors, the committee can recommend Messrs. Meyer H. Berliner, Günther, Behrend and Co., Wiesenhütter and Wandel, and D. Witte Nachfolger in Stettin. Every exhibitor is, however, at liberty to apply for this purpose, and for the protection of his interests, to any other firm in this city. 6. Exhibitors must be at the charge of insuring their own goods. The above-mentioned commissioned-agents are willing to undertake the insurance of exhibited articles. The committee cannot be held responsible for loss occasioned by fire, theft, &c., but will take the most ample measures for the security of the articles exhibited. 7. The name and residence of the exhibitors, and, if possible, also the price, must be affixed to each article exhibited. Articles which are not for sale must be marked as such. 8. Exhibitors are at liberty to charge either the committee or any firm of this city with the sale of exhibited articles. 9. Inflammable or easily exploding articles, such as spirits, oils, acids, corrosive salts, will only be admitted in strong and well secured glass bottles. 10. Articles for exhibition will be received by the committee in the Exhibition building from the 1st of April to the 1st of May, 1865. No article can be withdrawn or sent back before the close of the exhibition. 11. Articles of great size or weight, the placing of which will require considerable labour, must be sent before the 15th of April. Bulky articles, which will have to be sunk firmly in the ground, such as machines, must be specially mentioned in the notice sent in by the exhibitor. 12. Exhibitors, who may wish to have their machines worked by steam, must make the necessary arrangements with the committee beforehand. 13. Exhibitors, after obtaining permission from the committee, may appoint assistants to keep in order the articles they exhibit and explain them to visitors; but such assistants will not be allowed to offer such articles for sale. 14. At the close of the exhibition there will be a distribution of prizes, the manner of which will be subsequently fixed and made known. Application has already been made to Government for permission to dispose of the exhibited articles by way of a lottery.

Proceedings of the Society.

Fourth Ordinary Meeting.

Wednesday, December 7th, 1864; William P. Andrew, Esq., in the chair.

The following candidates were proposed for election as members of the Society:—

Abel, Charles Denton, 20, Southampton buildings, W.C.
Brinsmead, Henry, 12, Rathbone-place, W.
Sharp, Philip Henry, 18, East-parade, Leeds.
Simonds, Professor James B., Royal Veterinary College, Camden-town, N.W.
Simpson, J. Hawkins, 40, Bedford-place, Russell-square, W.C.
Smart, James Joseph, United Service Club, Pall-mall, S.W., and 3, Lambton-terrace, Westbourne-grove, W.
Sundius, Charles C., 54, Picadilly.
Thompson, Frederick, Urmstone Lodge, Wimbledon-park, S.W.
Varnell, Professor George, Royal Veterinary College, Camden-town, N.W.
Wetherfield, George Manley, 35, Moorgate-street, E.C.

The following candidates were balloted for and duly elected members of the Society:—

Barker, Charles Stuart, 12, Buckingham-street, Adelphi, W.C.
Durham, Makin, Thorne Hall, Thorne, Yorkshire.
Gale, William Joseph, 32, Torrington-square, W.C.
Hale, William, 6, John-street, Adelphi, W.C.
Kirchner, John, Peckham-common, S.
Partridge, William, 48, Newgate-street, E.C.
Pistrucci, Valerio, 28, Camden-street, N.W.
Pite, Frederick Robert, 38, Bloomsbury-square, W.C.
Pittar, Arthur, 4, Kensington Park-gardens, W.
Rowlands, Percy Jones, 24, Notting-hill-terrace, W.; and India Office, Westminster, S.W.
Slater, Robert, 104, Fore-street, E.C.
Smith, William Binns, 3, Upper Bedford-place, Russell-square, W.C.
Thompson, F., South Parade, Wakefield.
Tichborne, Sir Alfred, Bart., Tichborne-park, Hants, and 13, James's-street, Buckingham-gate, S.W.
Todd, William, 24, Wellington-road, St. John's-wood, N.W.
Tozer, Thomas, 55, Dean-street, Soho, W.
Van de Weyer, M. Sylvain (Belgian Minister), 3, Grosvenor-square, W.
Venning, Walter C., 9, Tokenhouse-yard, E.C.
Verschoyle, Colonel H., 23, Chapel-street, Belgrave-square, S.W.
Wilson, George, Cyclops Steel and Iron Works, Sheffield.
Wingate, James Forman, Club-chambers, 15, Regent-street, S.W.

The Paper read was—

THE CONSTRUCTION, TRACTION, RETARDATION, SAFETY, AND POLICE OF RAILWAY TRAINS.

By W. Bridges Adams.

Wagons and carriages are kept short on railways in order that they may roll round curves. Viewing a train of wagons from a bridge, every wagon will be seen to oscillate from side to side on the rails, following the course of curves and irregularities. Every wagon is drawn by a loose coupling chain, some eighteen inches in length, and the oscillation is so violent that, though goods and coals suffer it, and suffer from it, it would be unendurable by passengers, so the carriages of passenger trains are close coupled together to keep them steady. But in this process the wheels, as constructed, are debarred from following their own courses, and are compelled to slide. The result is a great wear of flanges and of axle-brasses, and a large consumption of coke. Were a train of goods wagons as close coupled as the passenger trains it would be simply impossible to move them. The first thing an engine-driver does, when about to start a goods train, is to back the whole of the wagons one on to another, and then start them one at a time in succession, by snatch after snatch at each chain, which is therefore required to be of enormous strength, in proportion to the resistance of the vehicle to traction by reason of bad structure.

The necessity for close coupling the passenger trains, arises solely from want of the efficient structure to induce free movement to make each carriage tractable instead of resisting—docile and not wilful. The first thing is to attain great length to prevent pitching movement, just as is the case with vessels on water. But with long vehicles, radial movement of the axles must be attained, as described in a former paper. Radial movement may be obtained by radial axle-boxes to the end wheels very effectually with one pair or two pairs of central wheels to serve as fulcra on the rails, or with frames of iron fixed to the axle-boxes and guided by the traction rod and buffer. The traction rod in such cases will serve in the same mode as a carriage pole on the highway. And swivelling buffer springs will, by coupling chains attached to the iron frames, keep the wheels in the right position while backing the train on curves. Or, if two pairs of wheels, coupled together at each end of the frame, be arranged with a quadrant or a pivot over one axle and a radial curved bar over the other axle of each pair, they will be self guided on the rails, and a carriage thirty feet long may thus roll round a curve of fifty feet radius, and the steadier will it run, and the less will be the likelihood of getting off the rails, and moreover the less will be the proportionate dead weight of the vehicles to the available load it carries, if it be rightly constructed. The Americans and other people use long carriages with swivelling trucks supported on a centre pin, which also have eight wheels, and thus radiate the axles imperfectly, though, if the trucks have not length enough, say two feet more than the width of the gauge between each pair of axles, they will not run steady, but will drag their wheels. If the radial system be applied, it would be quite possible to make carriages forty feet long with eight wheels to roll round a curve of 60 to 80 feet radius. A rough model of a vehicle of this description is on the table, and the guiding apparatus of the wheels is not intended for a bogy carrying the load, as in the American carriages, but simply a radial guide, the load of the upper frames being borne by the springs on the axle-boxes, with facility for elastic sliding, or swinging on long vertical shackles.

Some time back a series of medical papers appeared in the *Lancet*, on the subject of the injury experienced by a certain class of patients from railway travelling. The fact was strongly denied by railway authorities, and by many persons in good health who were not authorities. Not long back a railway engineer who had been very doubtful of the injury, informed the writer that he had changed his opinion, for, being out of health, and desiring to travel backwards and forwards to Brighton, he found he could not do it on account of the injury caused by the vibration.

It may be remembered, that when the Brighton line was first opened, numbers of City stock-brokers and merchants took houses at Brighton, and yearly tickets to travel up and down daily, in short, to live at Brighton and transact their business daily in London. The writer has been informed that many ceased the daily practice at the end of the month, and at the end of six months it was found that hardly any could stand it and preserve their health.

Now, what is the reason of this? The carriages were as comfortable and easy, and as well ventilated as an ordinary sitting room when not in motion, and the only difference therefore could be, that the sitting room is stationary, and the carriage moves. But what is the kind of movement? There must be something peculiar in it for physicians to order their nervous patients to travel by road and not by rail. There are two mechanical differences. The road carriage has wheels proper, with independent movement and elastic wooden spokes, and elastic springs, and the wheels roll over a rough but not constantly hard surface. Riding in an omnibus along Cheapside, the rider finds the stone pavement hard and irregular, and the iron pavement much harder though regular, and the iron is the most unpleasant of the two.

The rail carriage has a kind of iron garden rollers for wheels, and they run on a small but hard iron surface. If the carriage be travelling at a mile an hour, as when starting from a station, the movement is scarcely perceptible, but when at thirty to forty miles an hour, the vibration becomes unpleasant to most, painful to many. In slow movement the wheels can adjust themselves to the rails, and roll or slide easily. In rapid movement they have no time to adjust themselves, but slide as well as roll with incessant jerking. On very sharp curves the movement is sometimes all sliding.

It is this sliding which constitutes the difference. We may illustrate it as follows. Everybody knows that the sound of a violin is induced by rubbing the horse-hair string of a bow over the strings of the violin, both being in tension. But the simple horse-hair will not produce the effect. To produce sound the player applies powdered resin to the horse-hair to induce friction, and it is the leaping of these particles over the strings that induces the vibration resulting in "sweet noise." Sometimes, they who love loud laughter better than sweet noise, will, as a practical joke, apply a tallow candle surreptitiously to the horse-hair bow instead of resin, and then the vibration causing the "sweet noise" is stilled. Now the wheels on a rail are a contact of practically rough surfaces, which vibrate and induce torsion of the axle, and thus vibrate and jump, and the result is, not "sweet noise," but very unpleasant noise and jarring, which, if long enough continued, makes a nervous passenger ill, and tends more or less to counteract the peristaltic motion of the intestinal canal. If the rails and tires were rubbed with the tallow candle before alluded to, the vibration would cease, at least till sand enough had accumulated to counteract the effect of the tallow. But the engine-driver would not approve of this plan, as it would lessen the power of haulage.

How, then, is this vibration to be lessened? Firstly, by lessening the hardness of the rail, and rendering it elastic. Secondly, by rendering the wheels elastic. Thirdly, by permitting wheels, or tires, or both, to revolve independently of each other. Fourthly, by radiating the axles so that neither on curves nor straight lines will the wheel flanges be ground against the rails. Fifthly, by efficiently springing the carriages, using a double series of springs, as well known in private carriages. Sixthly, interposing a non-vibrating material, such as india-rubber, between the carriage body and frame. Seventhly, by so constructing the bodies that passengers may stand or sit at pleasure. The blood cannot circulate freely when in a constant sitting position. Sedentary employment is a common source of paralysis.

The next question is that of brakes in absorbing momentum by friction.

When a large mass of material is put in motion it requires at first a much greater amount of power to start it into motion than it does to keep up that motion when speed is attained. The power required to get up the speed is called momentum, and if it be required to stop the momentum it must be absorbed by friction or gravity. If the stopping-places of railways were always on ascents there would be no need for brakes; gravity would supply the place of friction. And if the starting places were always on descents, little surplus power would be needed to produce momentum, as gravitation would furnish it. But momentum has to be absorbed under many varying circumstances,—sudden obstacles to be averted or stopped short of,—stoppage at stations,—and the descent of long inclines; also the ascent of long inclines, in case of couplings breaking or wheels slipping.

In the early times of tramways the Convoy (*convoi*) or brake carriage was used with the train. In the early times of railways brakes were applied to first-class carriages, each worked by a guard, because the first-class were the heaviest. But people who paid first-class fares demurred to this, and sliding brakes were adopted, working on the wheels and axles without attachment to the body, and thus jar was lessened but noise was increased, and so the brakes were transferred to second class, and then the old Convoy—the brake van—was revived, one at the head of the train next the tender, and the other at the tail, and when the train was heavy, one in the middle

But it was to a very small portion of the total weight of the train that the break power was applied, and the guards screwed down the blocks tight, and so skidded the wheels and ground flat places on the tires; and to apply brakes rightly every wheel in the train should have a brake block applied lightly to it, from the engine to the last carriage. The engine should have brakes pressing on both rails and wheels, applied by the driver, through the agency of steam friction, by simply turning a steam-cock, the pressure being divided between the rails and wheels in in any convenient proportion. Brakes on every vehicle in the train and on all the wheels would reduce the pressure required on each to a minimum. The system of "continuous brakes," as they are called, is applied to as many vehicles as the power used can reach. But the power used is commonly hand-power, and that is limited.

A new mode has lately been adopted on the North London line of making the momentum destroy itself. On this line of short mileage and many stations, with frequent trains, it would not be possible to work the traffic without the means of rapid stoppage, *i.e.*, the utmost rapidity short of concussion. For this purpose a chain of sufficient strength to draw the whole train is extended beneath and throughout the train. When this chain is drawn straight, the blocks are all on to every wheel, and when the chain sinks into a succession of curves, or bights, by a weight beneath each carriage, the brakes are all off. To draw the chain straight, a pair of heavy cast-iron disc wheels, with a barrel or drum on their axle, are then suspended in slings below the last carriage. The guard, by means of a screw, brings these suspended wheels into close contact with the running wheels of the carriage, and the friction causes the disc wheels to revolve by the momentum and to wind up the continuous chain on the barrel till it is drawn straight, and the brakes are all on, when the disc wheels begins to slip, and the momentum of the train is absorbed by the brakes. In this mode a train of fifty vehicles may be stopped in as short a space as a single vehicle, the right amount of friction being applied to each. This arrangement, however, requires either that the chain be carried through the whole train, and accurately connected with the proper lengths of chain to each carriage, the whole train being pulled close together, or that the break-van at one end and the engine at the other, serve as fixed points to lift the counterbalance weights and draw the chain to a straight line. There is no doubt of this acting well on trains fitted for the purpose, but the writer has not yet seen it applied to mixed and irregularly made up trains.

With regard to the application of brake blocks, there is an advantageous and a disadvantageous method. If applied to the fronts of the wheels, that is in the direction of the pulling engine, they do not chatter on the wheels, whether fast or loosely applied, but when brought into contact with the backs of the wheels they do chatter, till the pressure becomes very strong, so strong indeed as to skid the wheel. The longer the block, *i.e.*, the longer the surface of tire it embraces, the less is the chatter. But it would be far better to arrange the blocks between adjoining wheels, so as to press both rail and wheels, and in this mode there would be no chatter.

But though the continuous brakes before described act so well on continuous trains of vehicles, the action depends wholly on the continuity of the chain, as well as quick movement to apply them. If the chain separates, the brake action ceases at once, and this on a steep gradient might be disadvantageous. It is, therefore, desirable to have the brakes self-acting, if possible, without depending on the human hand, and operating on every vehicle independently of the others—operating also instantaneously when required. The writer was led to study this question, owing to the necessity of enabling the brakes to follow the wheels of radial carriages on curved courses.

To put this in practice brake blocks are suspended from cross shafts attached to frames resting on the axle-boxes of the wheels. To these blocks long weighted levers are fixed, which cause the blocks to press against the wheels with either a steel-yard action or, what is called, an elbow joint, four blocks being used, one to each wheel, with two levers or rods to cross bars. Thus the normal condition of the blocks is, to be pressing on the wheels with a power sufficient for the purpose. The lever ends are attached to the brakes rod by a chain passing between two pullies on the carriage frame, and as in the process of traction the rod moves lengthlong in the carriage to either end, the chain lifts the levers vertically, the traction force of each vehicle being sufficient for this purpose, and this process operates on every vehicle so fitted, even though ordinary vehicles be interspersed in the train; and in ascending an incline, if a traction coupling parts or breaks, these self-acting brakes will instantly press on the wheels before back movement of the wheels can commence; and in going down hill the brakes will be lifted while the engines is pulling, but will be in action directly the engine is slowed, and they may thus go on pressing and lifting, and so moderating the speed down an incline. It may be objected that the power of the brakes might thus be in excess, and so be a disadvantage, but to equalise this, every vehicle is to be provided with a hand lever, which will enable the driver to put temporarily out of action as many brakes as he may choose, leaving in action the number required for his purpose. The model of the carriage on the table is on a length of rail which may be placed on the level, or at angles of one in 1, in 20, 60, 50, 40, 30, 20, and 10. It will be found that brakes so applied, will retain the vehicle on an incline of one in fifteen, and by snatching the brakes rapidly off and on, starting and stopping may be rapidly performed. In practice the ends of the levers may have sliding balance weignts applied, so as to increase or diminish the pressure by the length of the leverage. It must be borne in mind, that the tractive force required to draw the wagon while running, must govern the weight required to be lifted at the brake levers, and in cases where much weight is needed, the mechanism for lifting must be arranged accordingly. When the whole of the wheels are provided with brake-blocks, a comparatively slight pressure on each tire will suffice.

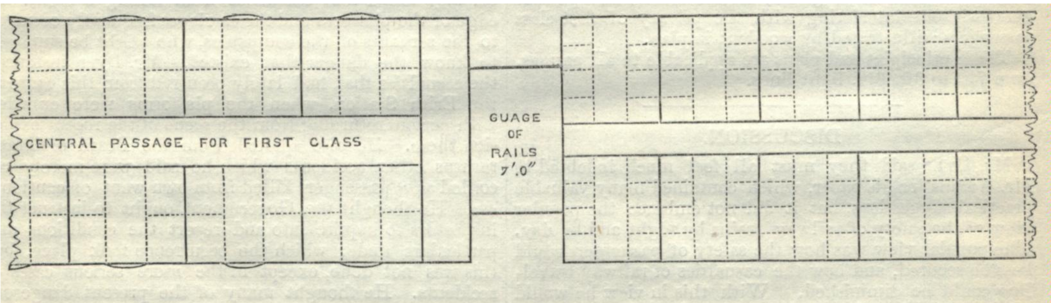
The longer the vehicle the longer may the brake lever be, and the more effective will the vehicles be both for goods and passengers. Coal wagons are made short, for the convenience of getting close to the pit's mouth, but the model on the table, representing a wagon 30 feet in length, will roll round curves of 50 feet radius, and by its great steadiness will carry the coal—a very friable substance, with far less breakage. And a long wagon may be made considerably lighter in proportionate dead weight than two short ones, thus adding to the available load. In these days of competition in coal transit, this is a very important consideration. The self-adjusting brakes described will work equally well, whether the engines be on straight lines or sharp curves, as the levers are arranged to act equally well in either case. And as it is needful occasionally to back the train, for which purpose the brakes must be out of action, this may be accomplished by connecting the traction rod to the buffer rods or buffers by spring agency, so that the thrust of the engine may lift the chains and brake levers in succession, and put the whole out of action, or they may be lifted by hand levers as at present practiced. This class of brakes is especially adapted to steep gradients. There is nothing new in the principle now proposed. It is the safety principle in the cages of mining shafts and on some railways with rope traction.

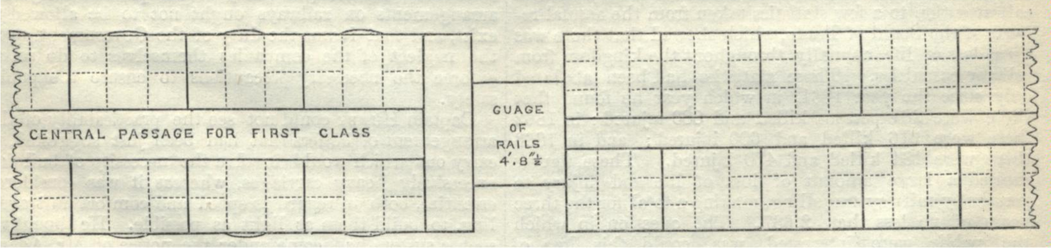
The last question we have to deal with is what we may call the police of railway trains. This is a question of structure. Trains are subject to catch fire on the roof; passengers may be taken suddenly ill; murders may be taking place, or other violence, but the sound of the train deadens all other sounds, and neither driver nor guard knows of it. And so there is an outcry for communication between passenger and guard, and guard and driver. And there are propositions for galleries outside the carriages for guards to walk along and catch murderers in the act. It seems to be forgotten that this facility for the guard would also be a facility for the thief or murderer. The practicability of these things is not considered. It is common to talk of the "six-foot" between the two lines of rails as giving ample space for the guard's gymnastics, forgetting that the "six-foot" is reduced to two feet by the overhanging carriages, and that two guards on opposite lines would thus come into collision, and, in American phrase, be "rubbed out."

If the guard is to patrol the train, there is but one way of doing it—through the inside—a passage way through the whole length of the train. Third class would probably not object to this, as they are disposed to be gregarious, and would not object to a guard or policeman additional, but second class might object, and first class assuredly would, on the score that they had paid their money for space and privacy. If it were put to the vote there is little doubt that the vote would be for privacy and a certain amount of risk, rather than gregariousness without risk. It must have been a matter of observation to those witnessing the starting of trains, how first class passengers walk along till they find an empty compartment, and, failing in this, make for one with the fewest occupants. And second class will do the same.

Were the lines single there would be no difficulty, as the carriages might be widened at least to the full extent of the tunnels, but with double lines the "six-foot" is the limit, and sometimes the "six-foot" is only five feet, and even less. With the six feet it would be practicable to have carriages two feet wider, provided only that the passengers would consent to have a wire guard to the windows limiting the protrusion of their hands, like the grating to the windows of a Spanish house. With a carriage ten feet wide, it would be quite practicable to have a closed passage in the centre, two feet wide, and compartments for four persons each, thus getting rid of the objectionable centre seats. The external doors would be retained, and there would be sliding doors inside opening into the central passage, communicating with end platforms. The second class and third would dispense with the closed passage. Sliding doors, glazed, would prevent the entrance of wind or rain through the central avenues. In this mode it would not be merely on the guard that the passengers would rely for protection, but also on the facility of intercommunication with each other in case of necessity. But if the brakes were all left to the driver, as they should be, the guard would have ample leisure to attend to the police of his train, instead of having his time taken up with the mechanism. Great Western carriages in the first class are divided length long by a partition, with the disadvantage that the compartment next the platform on the near side has to serve as an ante-room to the other. If the carriages were two feet wider this difficulty might be avoided by a central passage. No doubt this might be all very much simplified by making the whole train a series of open saloons, as in America, but public taste must decide this; and even in America they are now beginning the system of private compartments. With the exception of occasional alterations at platforms, it would be quite a practicable thing to widen the whole of the existing carriage bodies, by dividing them in the centre longitudinally and inserting the extra width as ships are occasionally dealt with to lengthen them. And there would be one considerable advantage, that by widening the train the length might be shortened, or a larger number might be carried. It may be objected that a small number—four persons—in one compartment might involve risk in plotted crime; but it would be quite practicable to make one side of the vehicle closed and the other open compartments.

Broad Gauge.





Narrow Gauge.

As a matter of safety in case of collision, the larger carriages are preferable, as they do not mount on each other's backs. As regards the expenditure of momentum by sudden stoppage, which throws passengers violently in each others faces, the safe remedy would be sitting sideways instead of fore and aft; they would be shoulder to shoulder, and in the safest position; but even in this case it is possible that they would prefer the ordinary position with risk, to side-sitting without risk, at least till they had a practical verification by frontal damage to their persons. The subject is so large that the writer has only dealt with it summarily, but a useful purpose will have been answered should the paper have given new materials for thinking.

In conclusion, it will be well to help the memory of the reader by a summary of the various propositions contained in the two papers having reference to the amendment of corresponding defects:—

1. Spring tires, for the purpose of preventing blows and friction and lessening the chances of the wheels escaping from the rails, a system thoroughly verified in practice, as quadrupling the durability; illustrated by a woodcut.
2. Systems of elastic permanent railway, supporting the rails by continuous elastic bearing, preventing disintegration of the rails, as verified in practice; illustrated in timber and metal, by woodcuts.
3. Improved system of fish-joints, duplicating the strength, with elastic fit of ribs and bolts; illustrated by a woodcut.
4. Radial axle-boxes, to enable locomotives of great length to pass round any sharp curve without friction on their flanges—in practice; illustrated by a woodcut.
5. Eight-wheel tank engines for sharp curves of 99 feet radius, long verified in practice; elevation and plan illustrated by woodcut.
6. Eight-wheel tank engines, for curves of 99 feet radius, all eight wheels drivers, both on straight lines and curves, by means of super-improved friction-wheels, all capable of retardation by steam brakes, making the whole weight of the engine available for traction or retardation; illustrated by woodcut.
7. System of V flanges to spring-tires working into V grooves of rails, to obtain increased bite for ascending steep inclines, or when starting with heavy trains; illustrated by a woodcut.
8. System of long waggons and carriages on eight wheels, radial axles, and guided by quadrants, with sliding springs, or long swinging shackles, to roll truly round curves of from forty to eighty feet radius, and provided with self-acting brakes, to prevent accidents on steep inclines—economically and easily carrying large loads.
9. Mode of constructing passenger carriages to give free internal circulation to guard, engine-driver, and passengers, without interfering with the privacy of first-class passengers; illustrated by woodcut in plan.

These principles and plans are applicable to all gauges, from 7ft. to 3ft. 6in. light lines.

DISCUSSION.

Mr. DYER said they must all feel much indebted to Mr. Adams for his paper, which contained many valuable practical suggestions, but it did not embrace the popular view of the safety of railway trains by night and by day. The popular view was how the safety of passengers could best be secured, and how the casualties of railway travelling could be diminished. With this in view he would call attention to a few statistics taken from the annual reports of the Board of Trade, which showed that there was great loss of life annually throughout the kingdom from railway casualties. Those statistics had been tabulated only since the year 1861, in which year he found that there were 284 persons killed and 883 injured; in 1862 there were 216 killed and 600 injured; and in 1863 there were 184 killed and 470 injured. These figures showed a large amount of loss of life and injury to persons by railway travelling, making a total for the three years of no less than 2,637. The question in which the public were interested was, could this loss of life and injury to person be reduced? and in this they were more interested than in the mechanical management or construction of a railway. A great number of lives, he believed, might be saved, in cases of collision, by a contrivance (a model of which he had placed on the table), and which, he said, would prevent the upsetting of carriages in case of collision. The loss of life occurred, in a great measure, from the upsetting of carriages on the road. If the carriages could be maintained in their proper position, the passengers would seldom suffer more than a violent shaking, but immediately a collision occurred the upsetting of the carriages ensued, and loss of life and injury to person, to a great extent, was the result. He considered the present buffer arrangements of trains extremely faulty, inasmuch as their line of action was too low, and gave a leverage, or pressure, which in case of collision lifted the carriage over. He held that there ought to be what he termed a square pressure from end to end of the train, which would enable the carriages to sustain the pressure without being upset; in other words, the carriage could be pressed to the extent of the crushing power before it gave way. The arrangement he suggested consisted of a top and bottom line of buffers, which rendered a train like a continuous carriage in point of resistance to pressure from end to end. If the train could be formed of one continuous carriage, upsetting would be impossible, for, however violent the concussion might be, it would be impossible to upset the carriage. The arrangement of buffers he had suggested would practically make the train into a single carriage. Another question was the frequent loss of life that occurred at station platforms, from persons getting in or out of carriages while in motion. He submitted that all the platforms should be built up to the level of the flooring of the carriages, and that a dangerous space between the platform and the carriages ought not to exist. There was great want of uniformity in the height of railway platforms. He found at Charing-cross station the height of the platform was three feet, while the average height of the flooring of the carriages was about four feet from the rails; consequently, there was an ascent of twelve inches to the carriage. At London-bridge station it was about the same. On the Brighton line, at London-bridge, the platform was only twenty-four inches in height, which gave an ascent of two feet to the carriages, with a space of eighteen inches between the edge of the platform and the carriages, and this he held was dangerous in the extreme. However thoughtless or stupid the public might be, they found that casualties from falling between the edge of the platform and the carriages frequently occurred to the servants of the companies, who might be supposed to know the danger that existed. Mr. Dyer instanced the casualties that had lately occurred from this cause at the Erith Station, when the platforms were crowded with persons returning from the scene of the recent explosion there. He also quoted from the Board of Trade returns other accidents which he said were merely recorded as "passenger killed from own want of caution," &c. He thought the Government ought to instruct the inspectors to inquire into and report the conditions and particulars under which the occurrence took place, but this was not done, except in the more serious cases of accidents. He thought many of the present dangerous arrangements on railways ought not to be allowed to exist, and that it was the duty of the Government, upon the neglect of the companies themselves to do so, to enforce the necessary precautions to ensure the public safety.

Captain HUMBY could not see the practicability of the arrangement of buffers that had been just suggested, to carry out which would involve the necessity of building excessively heavy carriages, whereas it was considered essential, both in regard to speed and comfort in travelling, to build them as light as possible. He thought if such a system had come under the notice of Mr. Adams in a way that he could entertain, he would have noticed it in his paper, and given his opinion upon it.

Mr. S. TEULON said the last speaker but one had suggested that railway carriages should be provided with two sets of buffers. He would appeal to gentlemen who had any knowledge of mechanics and of the laws of bodies in motion, whether it was not undisputed that the best point at which to stop a body in motion was not as near as possible to its centre of gravity. In the case of an engine with the boiler filled with water, and perhaps carrying a tank on the same frame, he submitted that the line of the centre of gravity was not very far from where the buffers were ordinarily placed. At one time the practice obtained of stopping trains on sidings by the very ready but, as it had proved to be, very dangerous method of turning up the ends of the rails. The consequence of this arrangement was, that as the centre of gravity was above the wheels, they, coming in contact with the bent-up iron, had a tendency to be thrown out of their places. The remedy for this was found in putting up an earth bank, against which the buffers impinged, and he could state, from his experience on a very large railway, that since that plan had been adopted the injury to the wheels and axles had been largely diminished. In the plan now suggested what would be the consequence of anything happening to the lower buffers? If the top buffers took the strain, it would push the roof off the carriage, which, he apprehended, would be very inconvenient to the passengers inside it. With regard to the complaint that the platforms were not placed at a uniform convenient height, it must be remembered that railways were not the system of a day. They had gradually grown up, and improvements had succeeded from time to time. In making a new station, such as the Charing Cross, the directors had adopted a higher platform. The Brighton station was built many years ago, but he had no doubt, when it became necessary to make new stations, the directors of that company would follow the example of their neighbours, the South-Eastern. While speaking of the Brighton Railway, he would notice a passage in Mr. Adams's paper, in which he referred to a subject which had excited a great deal of public discussion, viz., the alleged injury to the health of persons constantly travelling by railway. The best answer to that allegation was the fact that, taking the statistics of the Brighton Railway, he found a very large increase from year to year of the class of passengers daily travelling to and from Brighton and intermediate stations as season-ticket holders. The report which was distributed among the shareholders of the South Eastern Railway Company in the early part of this year contained a table, which showed that while in 1855 the season tickets brought in near £21,000, the amount had gone on increasing year by year, with but one exception, until up to the present year it reached the sum of £34,693. He at one time, as a traveller by railway and road 72 miles, four or five days in a week, fell into the notion that he was being seriously injured by his railway travelling; but he must own now, having continued that injurious practice for upwards of ten years, he had the satisfaction of enjoying much better health than ten years ago. It was fair he should state the result of his own experience. He attributed much of the injury which some passengers suffered to this cause, viz., the short time that persons gave themselves to reach the station, which led to their arriving and entering the carriages in a flurried and heated state, unfit for travelling, especially in cold weather. They sat in drafts caused by the carriage moving rapidly through the air, and the caloric of the body was rapidly drawn from the feet, and the proper circulation of the blood interrupted. He turned from this question to the practical matters treated of in the paper. With many of the points advocated by Mr. Adams he entirely agreed. He agreed that a great deal of the mitigated wear and tear of railways and rolling stock was to be attributed to the better form of construction both of the line and the working plant. He had taken a little trouble in this matter since the last meeting, because he held it was of great advantage to discuss these subjects with a number of gentlemen more or less conversant with it, and although they might not agree on all the opinions expressed, they were in all cases the better for exchanging ideas with each other. In the year ending 1855, on a railway on which 2,272 carriages were employed, it was necessary to "turn up" from wear 1,884 pairs of wheels. The actual result was ·6726 as the proportion of wheels turned up in 1855, whereas for the year ending July last, the number of vehicles having been materially increased, and increased in size as well, the capacity of the waggons being increased from four and five tons to eight tons, they still found this gratifying fact, that the ·6796 in 1855 was reduced in 1864 to ·6533; and it was an equally gratifying fact that the quality of the tires—a matter on which Mr. Adams properly laid great stress—had very much improved, especially the Staffordshire tires. He found, on a comparison between the wheels used on two of the large metropolitan lines, that while, in the four years ending 1863, when a great many Low Moor tires were used on the one line, the result was a loss of ·60945, on a neighbouring line with Staffordshire tires it was ·60990, being a mere difference of $\frac{4}{10,000}$, and showed very favourably for the Staffordshire iron, which, ten years ago, they hardly dare use, as the quality did not near come up to that of Low Moor. With regard to wheels, the railway he was connected with (South-Eastern), gradually, during the last fourteen years, ceased to have perfectly solid iron wheels; they employed wood placed endways above a plate inserted for the centre of the wheel, and built up to form a wooden disc on which the tire was put by hydraulic pressure; they had also done this, and done it very successfully, viz., placed a rim of wood between the iron wheel and the tire. He should state that the former plan was patented by Mr. Mansell, the carriage superintendent of the South-Eastern. As the tires had become worn, they had cut out of hard wood a segment of an inch or inch and a half, and placed them between the inside of the tire and the iron forming the old wheel. These plans had answered so well, that whilst during the last severe winter, the tires of 150 pairs of wheels, some on iron, had elongated, where this hard wood had been placed between the tire and the wood of the disc, there was no wheel amiss, a very important matter in times of severe weather. The elongation of tires in winter time had been a very vexed question, but he thought a little consideration would bring them to this conclusion. The road in severe weather, especially if the frost had been preceded by wet, was in its most rigid state. Then the inner portion of the wheel, when of iron, was in effect the same as if the tire was placed between rollers, and consequently it elongated the tire. With reference to the model of an elastic road shown by Mr. Adams, he imagined that was another move in the right direction, and that plan had been adopted on one of the lines running from Manchester. The chairs were placed between the wheels, as in that model, and he stated this on the authority of Mr. Ashcroft.

Mr. Adams—If the plan was good why did not Mr. Ashcroft employ it on his own lines?

Mr. Teulon said it must be well known to Mr. Adams that a framed longitudinal road was formerly employed on the viaduct portion of the Brighton line, and was one of the best parts of the line; but owing to the great number of trains, when it was taken up it was impossible to put down another road like it. It was, however, in use some ten or twelve years with success. With regard to the spring tire wheels which Mr. Adams had shown, he (Mr. Teulon) thought that in ascending inclines difficulty would be found, inasmuch as the wheels would slip in the tire for want of sufficient friction.

Mr. Adams—The objection could only apply to the driving wheels of engines; as regarded other wheels facility of slip was a positive advantage. As regarded driving wheels positive experiment, which was worth more than any theory, had demonstrated that even when the tires, as stated in the paper, were so loose that they could be moved round by hand (with the weight lifted), they drew their load perfectly well. Mr. Adams would go further, and say that loose tires, even without springs, would act in the same way, although of course disadvantageously for want of the elastic interception of blows, and the equalising movement of the tire on its basis of contact with the rail.

Mr. **Teulon** added that Mr. Adams had stated very correctly that all changes with regard to railway plant, especially with heavy and powerful bodies like engines, must be made with great caution, and therefore he was content to wait on this point till he saw more of the results. In conclusion he would say a word on the subject of the fish-joint. He saw by Mr. Adams's previous paper that he did not call in question the fish-joint at present in use, but he said he had got something better. He (Mr. Teulon) thought the public was very much indebted to Mr. Adams for his original fish-joint, and he hoped that gentleman had reaped some of the benefits of that invention. [Mr. **Adams**—Not a sixpence.] It was a good joint if the fish were properly made, and was one of the best things that had been introduced on railways for a long time. He would not say Mr. Adams might not have improved upon it, but the original joint had been a great advantage to all railways that used it.

Mr. **Adams**, in reply to the observations that had been made, said the model of the suggested application of double sets of buffers was simply a supplementary mode of attaining what he himself had advocated in the paper, viz., the long carriage. In the early days of railways a single buffer was used in the centre, but it was abandoned for the two side buffers. He did not agree with Mr. Teulon that it was a bad plan to put buffers in the position in which they were shown in the model, because it was notorious that short carriages would ride upon one another's backs. No sooner did they come into collision than, with four tons of buffer springs pressing, the first thing they did was to mount upwards on each other's backs, as they could not move downwards or sideways. That was well known from experience. He did not think that two sets of buffer springs, one above and one below, were desirable, but he thought it would be an advantage to apply cushioned blocks to the upper corners of the body, flush with the buffer heads when drawn home, to lessen the risk of the tilting upwards. With regard to the question of health, he could not fight against statistics; but in his paper he had alluded to what he understood was the fact, not that season tickets originally taken by gentlemen wishing to travel morning and evening to and from Brighton had been discontinued, but that very few persons could keep up the daily practice; and though the season tickets might have increased in amount *non constat* that all their owners travelled with them morning and night.

Mr. **Teulon** said his inquiry had been especially directed to that point, and there were persons travelling backwards and forwards continuously.

Mr. **Adams** was glad to find they had such quality of muscle in England, but one engineer had told him the practice did not suit him. And it was notorious that the faculty discouraged their delicate patients from the use of the railway. With regard to the wheels which Mr. Teulon had alluded to, before that gentleman had gone far in his remarks on that subject, he (Mr. Adams) was prepared with a reason why the wheels on the South Eastern Railways had lasted longer. It was solely due to the fact that they were wheels with solid wooden discs, which to a certain extent rendered the wheels true circles, and also removed the inner anvil from the tires. They could not hammer the tire on the surface of the wood as they could on an iron surface, just as the shoemaker in hammering his sole leather could not do it on his thigh as he could on a solid lapstone. As to wooden wheels, nobody knew more about them than he did. He was at one time a manufacturer of carriages and engines, and had turned out a great many of them. There came to him an order from the South Eastern Company for a number of very long carriages. Those carriages were notoriously the steadiest carriages that ever ran, but they did not answer in one respect, as he had not in them a radial movement of the axles, and the flanges cut against the rails. When the order for them was given, it was specified that the wheels were to be constructed on Mr. Mansell's patent. That patent was not for wood wheels, but consisted in applying, in an ingenious manner, a pair of angle-iron rings which keyed laterally into the grooves of the tire, and held to the wheel by cross-bolts through the wood, piercing through the head of the tire. In making a wheel the worst thing they could do was to make a hole through the tire, because it deprived it of a portion of its strength—probably one third. Another thing was, when the tire got loose on the wheel it indicated danger, which arose in this way—Where the tire was stretched by the process of rolling over the rails, the wheel being held down in eight points, it could not stretch where it was held, but became polygonal in stretching out between them, and the wheel in other parts became a sledge hammer, and in frosty weather the rivets got broken out. The original wheels of Mr. Mansell were composed not of a disc of wood, but of a series of screw spokes, the outside secured in the felly, and the inside in the nave of the wheel. On looking at that plan, he declined to make such wheels. He was asked how he would do it. He replied, make them solid discs with a series of radial timbers. He was told that was the patent of another superintendent, but he doubted the fact, as it had been done by Mr. Dircks many years before. He (Mr. Adams) had machinery made to cut the timber for those wheels, and they were the first that were thus made for the South Eastern line. He was then putting on Park-gate tires, said to be a brittle iron, but he found it perfectly hard, and of good quality. While these wheels were in course of manufacture, an accident occurred on the Midland Railway by the breaking of a tire, which cut through the bottom of the carriage, and nearly killed the railway king, Mr. Hudson. Inquiry was immediately made of the officials whose tire it was that had broken? and on being informed it was Park-gate, he issued orders that no more of those tires should be used on any railway of which he had the command. Upon this he (Mr. Adams) was asked if he intended continuing to use the Park-gate tires? He replied, he did. He was told they would break, to which he replied he was putting them on the wooden discs by pressure, and by no subsequent pressure could there be sufficient tension put upon them to break them. He believed these wheels had never broken a tire. The greater duration of the South-Eastern wheels was, therefore, due to the action of the wood, which prevented the rails and chairs becoming anvils for the tires to act upon. In America Mr. Griggs had put his engine-tires on with wood between the tire and the wheel, and by that means, no doubt, had increased the duration of the tire very considerably; but in the case of a wooden wheel, if the tire got loose by any chance, and began to move round, it would soon grind the wood wheel away. With regard to his plan of laying the rails elastically, a few years ago, Mr. Chubb, a director of the North London Railway, complained to him of the destruction of the rails on that line. His reply to that gentleman was, that they did not lay them right, and he offered to give him a plan if he liked to use it. He gave him this plan and it was determined to use it. A few lengths were laid down on the North London line with the ordinary rails and in other places. The rails did not touch the longitudinal timbers, and were supported, not by chairs, but by brackets. They had been down three years, but they exhibited no signs of destruction on the top, as was the ordinary result of the anvil action of the chairs and hard ballast. At the time he read a paper on this subject before the Institution of Civil Engineers, it was stated that that kind of road had been adopted before, but he was unable to find any trace of it, in any book or publication, or transactions. It was asserted that it had been done by Mr. Buck, who he admitted was a perfect judge of a good line. He inquired where it had been laid, and was informed on a viaduct; but it had not been renewed on the same plan, and no one knew anything about it except those who laid it down. Mr. Teulon said he got his information from Mr. Ashcroft. Now the latter gentleman was a member of the Permanent Way Company, which had become possessed of his (Mr. Adams's) fish-joint. It was a company got together to secure all that was good in patents of every kind appertaining to the permanent way of railways. Mr. Ashcroft was, he believed, still a member of that company, and had a patent for a permanent way of his own, on which many heavy chairs were used, and it was only natural he should give the preference to his own plan. But that fact precluded either him or Mr. Teulon, who acted under his advice, from being unprejudiced judges of any clashing plan. He gathered from Mr. Teulon's remarks, that he wished, under his information from Mr. Ashcroft, to make it appear that he (Mr. Adams) was not original in his elastic system. But the truth he believed was, that Mr. Buck, a man in his own right, and not a copier, did use on a viaduct a system of interspacing his chairs between the rigid supports of the frames, to save the viaduct from damage. But in what was called the permanent way of railways, no such system was ever used. He (Mr. Adams) had embodied a known principle of nature to counteract the evil of hard ballast, more than once alluded to by the late Robert Stephenson, in discourses at the Institution of Civil Engineers. Mr. Buck was a man of clear perception, and he also took patents, but never took a patent for this elastic system, or ever mentioned it before scientific bodies. With regard to the framed longitudinal road on the Brighton line, alluded to by Mr. Teulon, it was laid with continuous bearing bridge rails on longitudinal timbers. The bridge rails deflected under the wheels and sunk into the timber to an inch or more in depth. An engineer of the S. Eastern line, when he first saw a rail removed asked, very innocently, "Why do you groove your rails into the sleepers?" thinking it had been done from the outset. This line was always harsh and rigid, and not one to be recommended. He (Mr. Adams) had devised a general system, and applied it equally to timber and metal sleepers, to prevent blows and breakage. With regard to the fish-joint, when the original joint was first produced, he (Mr. Adams) had not intended it to be used in the way it was now used. It was produced as a parallel support to the rail ends between two chairs, six inches apart; afterwards, for the sake of cheapness, it was proposed to bolt it. The form which was good in the chairs as a parallel fish was not proper as now used. It was notorious that the fishes bent at the joint, and as they had only three inches depth between the two upper tables of the rails, they were not deep enough to supply an equivalent in strength to the depth of the rails. Another thing was, they were parallel, and, being parallel, they added more strength than was wanted at the end of the fish to the rail, and that caused a blow, and less strength than was wanted at the joint of the rail, and that caused another blow. He (Mr. Adams) had now devised another form of fish. It so happened that the Permanent Way Company had made what they called, an improvement in fishes, and probably a dozen patents for improved fishes had since been obtained, and it was certainly competent for him, who originated the fish, to make improvements upon it. He did not think the public were thereby endamaged, nor did he think either the public or Mr. Teulon would desire to dispute his right to make a profit of his further improvements, even though the first fish had yielded a miraculous draught of coin to its possessors. He had seen few fishes of a worse form than the last pattern on the South Eastern line.

Mr. Davis wished to state that he had had some experience of the engine alluded to in the paper, as having been constructed for the St. Helen's railway, and was present, in company with the most eminent engineers and locomotive manufacturers, at the trials made with it on the North London line. When running on a straight line, at a speed of 68 or 70 miles an hour, he was very much struck with the beautiful motion of the axle-boxes. Running at that high speed, an inequality of the rails would sometimes cause the engine to give a jump on one side, but it immediately righted itself in the most beautiful manner. After the experiments he examined the wheels, and he noticed that the flanges were not abraded, but the tire had formed a groove corresponding with the surface of the rail. Although the papers of Mr. Adams were very comprehensive, there was one subject which had not been touched on. It had been stated in the discussion that where one carriage ran off the line, if the couplings did not break, the other part of the train would be dragged to destruction. He had had brought under his notice a very clever invention, by which the couplings of the carriages were so arranged that, taking into account the sharpest curves, the couplings, by a clever mechanical arrangement, immediately disconnected the carriage from the other part of the train, and saved it from destruction. He thought this contrivance should be more prominently brought before the notice of railway managers than it had yet been.

Mr. Adams said that on the St. Helen's engine they were all spring tires.

Mr. Davis replied in the affirmative, and added that he was much delighted with the sensible improvement in the non-vibration of the engine.

The Chairman had great pleasure in proposing a vote of thanks to Mr. Adams for his excellent paper. It was only to be expected that, looking at the scope of subjects embraced in this and the previous paper, difference of opinion on some points would arise. An objection had been taken this evening that Mr. Adams had not cared sufficiently for the public safety in railway travelling. Now if he understood aright the suggestions of Mr. Adams, they went very much in that direction, not only by diminishing the wear and tear of railways, but they had much to do with regard to the safety of the trains. He would not detain the meeting by entering into the fish controversy, but it illustrated the old adage that "there are as good fish in the sea as had come out of it." The first fish, and a good one, had been produced by Mr. Adams, and he was now ready to produce a better. Mention had been made of the safety of railway carriages, arising from their length and breadth, but no mention had been made of carriages having upper stories. For several years past that description of carriage had been worked on the Bombay and Baroda line, with much success and much safety, and so agreeable had it been found by the passengers, particularly the natives of India, that the company with which he was connected (Scinde, Punjaub, and Delhi) had adopted the plan, and used it for a considerable period. He would state as a question of railway management, that they could convey in one of those carriages very nearly as many passengers as they could in three ordinary carriages. Hitherto no accident had occurred, and the natives infinitely preferred the upper story. As one for many years connected with railways, he would express how gratifying it had been to him to have been present on this occasion, for he felt he had received a great deal of instruction, and it was very agreeable to him to hear that as they gained experience in railway construction the dangers of that mode of travelling were materially diminished.

The vote of thanks having been passed,

Mr. Adams acknowledged the compliment paid to him, and remarked that one element of safety in reference to those carriages on the Indian lines consisted in the gauge of 5 ft. 6 in., which allowed a wider base for the wheels of the carriages. With that gauge they could do a great deal more than with the national gauge of this country.

OPERATIVE COACHMAKERS' INDUSTRIAL EXHIBITION.

The following circular has just been issued by the committee:—

"The committee of the above have the pleasure to inform you that the proposed exhibition has met with more sympathy, support, and encouragement than they could have reasonably anticipated for so novel a venture in the coachmaking trade: not only has the Society for the Encouragement of Arts, Manufactures, and Commerce, consented to bestow its patronage on the undertaking, but the committee have secured the support and assistance of the Worshipful Company of Coach and Coach Harness Makers of the City of London. In reply to the memorial so numerously signed by all the principal London Coachmakers, and many of the most intelligent and enterprising of the operatives, the company have in the most handsome manner placed their Corporate Hall at the disposal of the committee for the purposes of the exhibition.

"The committee consider themselves most fortunate in having thus obtained the support and co-operation of two corporate bodies that have existed for so many years, and they anticipate the most favourable results from this connection of the City company, and trust that the advantages may be many and mutual.

"Messrs. Boulnois have kindly granted to the Committee the use of a most eligible committee-room at the Carriage Bazaar, King-street, comfortably warmed and lighted; this has been another great advantage, besides curtailing the expenses in a material manner.

"Although the sums receivable for admission will doubtless cover much of the expense, yet in so new and technical an Exhibition the Committee cannot look forward to any large sum from the general public.

"It is anticipated that by bringing together many objects of skill, ingenuity, industry, and curiosity, many and various advantages will be offered to the operatives, the coachmakers, and the general public, besides stimulating invention and skill. If the London coachmakers and friends and patrons of coachmaking will support the undertaking with subscriptions, the success will be rendered almost certain, and such success would tend to raise the trade of coachmaking to that position which it ought to occupy amongst the trades of the country, on account of the ingenuity and large capital, and very varied skill necessary to carry it on with success.

"A duly authorised person will, in a few days, call upon you, in the hope that the subject will receive your favourable consideration.

"Several sums have been already offered as Special Prizes:—

"Mr. G. N. Hooper offers three guineas for the best drawing of a town barouche on under and C springs—scale 1-inch to the foot. Open to foremen, carriage operatives, and apprentices.

"Also two guineas for the best drawing or model of a light hospital carriage to convey the sick poor. Open to all comers.

"Mr. G. A. Thrupp offers two guineas for the best stuffed and quilted carriage cushion in morocco leather. Open to coach trimmers only.

"Also two guineas for the best drawing in pencil upon paper (half the full size), of an under fore-carriage for elliptic springs, of usual or original design. Open to apprentices and improvers.

"It is suggested that such a special prize list offers an excellent opportunity to any individual or firm to stimulate skill, ingenuity, or invention in some particular channel that they may consider most useful; and directing the attention of the operatives to objects that would repay the time and thought bestowed on a subject, and which frequently unless guided has a tendency to be bestowed on matters that have no practical utility, though ingenious and clever.

"If you are the possessor of any curious models or carriage drawings, &c., that would be of interest in this Exhibition, the committee solicit your kind loan of the same during the period from January 21st to February 15th, 1865. The utmost care would be taken of them."

ADULT EDUCATION.

A conference took place on Nov. 22 at the rooms of the Society of Arts, John-street, Adelphi, in connexion with the Metropolitan Association for Promoting the Education of Adults, on the subject of the organization and management of night schools; Sir **Thomas Phillips** presided, and briefly explained the object of the meeting.

The Rev. **Henry White**, M.A., chaplain of the Savoy, delivered an address, prefacing it by stating that he had been largely mixed up in the conduct of night schools for several years, and that he had seen reason to change some of the opinions he had advanced four or five years ago. He proposed to confine his paper to the following subjects:—"The need for night schools specially suited to boys of an age stretching from 13 to 18. The desirableness of changing the name of night schools to the more attractive name of youths' club or institute. The best method of raising or adapting buildings for the use of evening schools. The advantage of reading and recreation rooms in connexion with the evening schools. The classes most needed to be formed for a boys' evening school. Are paid or voluntary teachers most to be desired and encouraged? How can night schools be maintained on self-supporting principles?" He then dilated at some length on providing night schools suited to boys between the ages stated, quoting a paper of Mr. Hollingshead, published last year in the *Daily News*, pointing out the difficulties under which "hobbledehoys" labour for want of congenial and profitable occupation in their leisure hours, and deducing from these premises the value of providing night schools, but under some other name, in which not only should educational facilities, but opportunities for amusement and social enjoyment be provided. He suggested that youths' club or institutes would be the more appropriate name for the institutions he contemplated, as expressing more accurately and attractively their proposed objects. The class he proposed to benefit was the sons of working men after they left school. He recommended that the National Schoolrooms should be used for these clubs or institutes, urging that it would be difficult to obtain the means of providing other buildings for the purpose, and that were it otherwise, the money spent in building or in rent might be much better employed. Besides, he believed that in the National Schools they would better secure the class of boys they desired to influence, and that this use of these schools would be advantageous in the education given in day schools. Again, there clustered round the National School a variety of institutes, savings bank, &c., of which the youths would avail themselves. He pointed out the various other advantages he anticipated from the adoption of this suggestion, as the obtaining of the government grant, the assistance of the National schoolmaster, and the sympathy of the parishioners. He considered paid teachers would be necessary for these night schools in addition to the voluntary educational and other help which would doubtless be afforded. He attached great importance to the assistance of ladies as a means of refining the habits, thoughts, and manners of the boys. He recommended compulsory attendance to at least three classes weekly, and that there should be a discretionary power of discipline. There should be a reading-room, a place for draughts, chess, and similar games, and opportunities, within certain limits, for education and social intercourse. This requirement might perhaps be met by devoting one hour previous to and one hour after study for amusement. And in the summer months there should be provision for cricket, boating, and gymnastics. He held it to be a vital point that those institutes should be self-supporting, and in this respect he admitted that he had committed an error in the institution he founded some years ago at the Lowther Arcade. The rate of payment must vary according to circumstances. 4d. to 6d. weekly had been found to meet the needs of London boys, but perhaps in the country 3d. or 4d. would be more suitable. He considered that there should be an entrance fee of double the weekly payment, as an inducement to continue attendance, but there should be no extra payments for lectures, classes, or entertainments. He recommended that there should be periodical examinations and distributions of prizes. All would, he thought, admit that some religious guidance was requisite for the members of these institutes. He would not exclude dissenters, but it was in vain to expect that a youths' institute could succeed upon the principle of embracing all denominations. He had seen many promising institutions come to grief from the impossibility of getting managers of different religious views to act together. If the dissenters desired such institutes they should provide them for themselves, but their starting point must be the church of England.

Mr. Harry Chester followed, explaining the advantages of Examinations as carried on by the Metropolitan Association, and showing the necessity of affording to the sons of the working classes the means of pursuing their education after the period at which they usually left the elementary schools. He described the nature and form of the Examinations of the Association, adding that none were examined under 16 years of age, and that the Examination papers were sent round to the localities where the pupils resided. He altogether dissented from the opinions of the last speaker as to the religious question, considering it of the greatest importance that members of the different religious bodies should be brought to act together in the work of education, and he was happy to say that he knew of several Institutions in which members of the different religious bodies laboured harmoniously together, and with the best results. He could state that the working classes were by no means indifferent to the value of continuing their education after leaving the elementary schools—on the contrary, there was a strong and even an enthusiastic desire for it. The Metropolitan Association did not confine itself to youths of between 13 and 18, to which Mr. White's paper was limited, but extended its facilities and its system of Examination to adults generally; and they actually found people coming up of the age of 45 or 50, although the majority were between 16 and 22 or 23. As to using the national schools for the purposes of these Institutes, he thought much was to be said on both sides, and pointed out numerous objections to the proposal.

Mr. Tabrum, hon. secretary of the Islington Youths' Institution, which had been alluded to by Mr. White in the way of illustration, offered some remarks explanatory of the system there pursued and the beneficial results.

A discussion followed in which the Rev. B. F. Smith, diocesan inspector of schools for the archdiocese of Canterbury; the Rev. Mr. Whittington, principal of the City of London College; Mr. Pearsall, secretary of the London Mechanics' Institution; Mr. Ford; the Rev. W. Baird, of Clare-market; Mr. Baker, of the Bayswater Institute; the Rev. A. B. Suter, Mr. Whittingham, Mr. Solly, Mr. Stock, and Mr. Currie took part.

The Rev. Mr. White replied briefly, and a vote of thanks was accorded to him and the Chairman.

Fine Arts.

Public Works of Art in Paris.—Architects, sculptors, and painters, have not for a long time enjoyed so much patronage as at the present moment in Paris. In all quarters of the city new buildings are rising; here a church, there an opera house, or a barrack, presently an hospital or a post office, and old edifices are being renovated and beautified. An important work has just been entrusted to a well-known painter, M. Robert Fleury, namely, the execution of four large works for the decoration of the great hall of the new Tribunal of Commerce, which has been recently erected, facing the Palais de Justice, and between it and Notre-Dame. The subjects selected are:—The Installation in 1563 of the *Juges Consuls*, or commercial arbitrators; the presentation, in 1673, to Louis XIV., of the Ordonnance of Commerce; the promulgation of the Code of Commerce in 1807, by Napoleon I.; and the inauguration of the present tribunal. The work will occupy the artist about three years. The river façade has recently been completed; it is ornamented with four colossal figures representing Law, Firmness, Justice, and Prudence, executed in Caen stone, by the sculptors Elias Robert, Endes, Hippolyte Chevalier, and Jules Salinson, and with cariatides by A. Carrier. In niches on the grand staircase are to be placed four grand allegorical groups, representing Maritime and Land Commerce, and Industrial and Mechanical Art, by Cabet, Michel Pascal, Maindron, and Chapu. A copy of the portrait of the Emperor, by the late painter, Flandrin, and which was exhibited in London in 1862, has been ordered of M. Ronjat for the great hall or audience chamber. The works connected with the courts of law and the prefecture of police have been pursued with great activity. One wing of the latter is completed as far as regards the outer walls; the new Court of Cassation is roofed in, and the ornamentation of the new façade of the Palais de Justice itself will be completed very shortly. The doors of the front, three in number, lead into the great vestibule, or, as it is called in Paris, the *Salle des Pas-Perdus*, a noble vaulted apartment. Within the latter is a very bold double staircase leading to the Courts of Assize. Another building, just commenced, will unite the old and new portions of the palace. The whole promises to be the most important work of the kind, after the Louvre and the Tuileries, executed in Paris for many years. Painters and sculptors are beginning to think of the annual exhibition, and are pushing on the works they have in hand rapidly; the decoration of four chapels in the church of Clignancourt, commanded by the authorities of the city of Messieurs Barrias, Emile Lafon, Michel Dumas, and Romain-Cazes, are approaching completion. The pavilion and wing of the Tuileries, which have been rebuilt, are now being crowned wth elaborate ornaments in hammered lead, and the ornamental work of that part which abuts on the quay is being commenced. On the other hand, the whole of that portion of the great gallery which was built in the reign of Louis XIV. is demolished, and its reconstruction, in harmony with the work of Henry IV., will be commenced forthwith.

Public Statues in France.—A grand monument is about to be erected to the Chevalier Bayard, the knight who gave François VI. his spurs on the battle-field, on the ruins of what was once his castle.—A monument to the memory of the painter, Hippolyte Flandrin, is to be raised in the old church of Saint Germain des Prés, where his best works are to be seen. These two memorials are to be raised by subscription, and the Emperor has headed each list with a donation of a thousand francs.—A statue of the naturalist, Daubenton, has just been uncovered in the Jardin d'Acclimatation in the Bois de Boulogne. Daubenton was a member of the Senate and of the Institute, professor of natural history, and member of nearly all the great scientific societies of Europe. France owes to him the introduction of the merino sheep. His remains are buried, according to his own desire, near the fine cedar of Lebanon, at the foot of the mound in the Jardin des Plantes, and a truncated column marks the spot.

Lyons Art Exhibition.—The exhibition of the Society of Friends of Art of the city of Lyons is announced to open on the 7th of January. The purchases at the last exhibition of the society amounted to about £2,300. The reception of works closes with the current month.

Exhibition of Old Faiences.—The town of Rennes opened an exhibition of French faïences on the 25th ult., which is to close on the 10th inst. The object, as expressed by the committee, is to institute a comparison between the various fabrics of the kind in France, and to elucidate the birth, apogee, and decline of this industry, to revive which great endeavours are now being made. An appeal was made to all persons who possessed specimens of the pottery of the 16th, 17th, and 19th centuries, and particularly for such pieces as bear signatures and dates, whether objects of ornament or utility. The undertaking is under the presidency of Dr. Aussant, who is an authority on French ceramic art.

Original Designs for Public Works.—It was the practice formerly of artists to give up to the authorities of the city of Paris the sketches of works executed, but from 1830 to 1863 this was not the case, and consequently the designs for the greater part of the Hôtel de Ville, and of other public buildings, by Ingres, Delacroix, Flandrin, Coignet, and other eminent artists, have been distributed. The municipality at present makes it an express stipulation that such designs and sketches shall become the property of the city, and intends to collect them together in a gallery. Such a collection will doubtless be highly interesting, but in some cases a great loss to the artist; the original designs by Eugène Delacroix sold for immense sums the other day, when his works were distributed by auction. The decision, however, may apply only to the finished drawings, and not to the rough drafts which are so much sought for by amateurs.

New Theatre at Palermo.—The authorities at Palermo have announced a competition for a new theatre, to contain three thousand spectators, and for which the sum of £100,000 has been voted. Five prizes are offered, varying in amounts from 25,000frs. to 2,000frs., and all the world is invited to compete.

Fine Arts in France.—Arrangements are being made in Paris for an exhibition of pictures exclusively of the German school. The Emperor has granted the sum of 15,000 francs (£600) for the completion of the exterior decorations of the museum at Orleans, which is installed in the house known as that of Diana of Poictiers.

Monument of Francois I. at Cognac.—This colossal group, in bronze, which M. Etex has had in hand for five years, was uncovered on the last day of October, in the presence of an immense concourse of people. The monarch to whom the monument is raised was born in the town of Cognac. The principal group represents Francis as conqueror at Marignan, at the moment when his horse is wounded by one of the Castillans, or mercenaries, whose sole duty was to disable the horses of knights and men in armour and bring the latter to the ground. The pedestal is composed of four immense blocks of marble, brought from Italy for the purpose; on its principal face, sculptured in alto-relievo, are two genii, supporting the arms of the hero, and resting on a battle-axe and a cassetête; on another face are the arms of the town of Cognac, and right and left of these are male and female figures occupied in gathering grapes for the vintage. The other sides are occupied by a bassi relievi in eight compartments, the subject being:—Louise of Savoie lying on the historic stone of the park, after having given birth to François, whom she called her Cæsar; François knighted by the Chevalier Bayard; the King sleeping on a gun carriage, his Italian trumpeter sounding the *réveil;* François in court dress giving audience and aid to artists and *savans* in the Palace of Fontainebleau, Leonardo de Vinci in the foreground; the field of the cloth of gold; Marguerite, his sister, visiting François when prisoner at Madrid; the citizens of Cognac refusing the ransom of the King to the envoy of Charles V., the Comte de Lannoy; François showing the tombs of Dagobert and Queen Nantchilde, in the church of Saint-Denis, to Charles V.

Statue of Claude Lorraine in Bavaria.—The young King of Bavaria has just had erected a monument in honour of the famous painter in the little chateau of Harlschug, where he resided for some years.

Manufactures.

Floating Storehouses for Inflammable Substances.—The accidents which have recently occurred with gunpowder and petroleum oils have induced the French authorities to establish a new system of storing such dangerous commodities. The method adopted is the construction of iron lighters, divided into proof compartments, and the isolation of these in rivers or basins. Two of these new magazines have just been launched at Saint-Ouen, between Paris and Saint-Denis, where an extensive commercial dock and entrepot have been established, and three more are under construction; each contains one hundred divisions, and each of the latter measures 25 tons in contents. The vessels are entirely of iron, but are covered on the deck and down to the line of flotation with wood, as a protection against changes of temperature. They are moored in the middle of a large basin, and can be swung round to the quay when required for loading or unloading.

New Mordant.—A new mordant, for aniline and other dyes, is said to have been discovered; it consists of acetate of aluminium and arsenitate of soda, and the discoverer, M. Schultz, believes that it is destined to replace albumen, gluten, tannin, and other matters now employed for the same purpose. He mixes, at the ordinary temperature, four grammes of the aniline violet of commerce, in powder, with a quarter of a litre of acetate of alumina, and twenty grammes of arsenitate of soda, thickening it with starch boiled in water—the quantity of starch to be diminished in proportion to the darkness of the colour to be fixed. In the case of prints, it is recommended to mix the arsenitate of soda and the acetate of alumina with the colouring matter, and to steam the fabric or yarns over the mixture. For dyeing, it is said to be better to treat the tissue, or yarns, in the first place, with a mixture of the two salts, and afterwards to dip them in the colour vat in the ordinary way. Salts or compounds of tin, combined with alumina, may be used instead of arsenical acid.

Discoveries in Electro-Plating.—M. Weil, a French chemist, announces a new method of depositing metals. The baths he employs consist of metallic salts or oxides in alkaline solutions by means of tartaric acid, glycerine, albumen, or other substances, which prevent the precipitation of the oxide by the fixed alkali, in some cases with and in others without the aid of zinc or lead, and at various temperatures according to circumstances. He claims also to be able, by like means, to give variety of colour to articles covered with copper by his process. M. Weil says that the most important application of his discovery is the deposit of copper and the bronzing of iron (cast as well as wrought) and steel, without the preparatory dressings with conducting substances, which are necessary in proceeding according to the ordinary methods before the object is placed in the bath and submitted to galvanic action. This, if it bear the test of practice, is a very important fact. Iron and steel thus coated with copper may, says M. Weil, be afterwards silvered or nickelised by his process.

New Blasting Powder.—M. Nabel proposes to make use of pyroglycerine (explosive glycerine) to increase the force of gunpowder for blasting purposes. It is said that experiments, made in the presence of a commission, prove that such a mixture is three times as effective as gunpowder alone. The cartridges made use of were of zinc; these were filled with gunpowder, and as much pyroglycerine was added as the powder would absorb. The detonation is said to be much less than that of gunpowder alone, but, on the other hand, the danger from accidental explosion is much greater, and, moreover, pyroglycerine is a powerful poison.

Iron Production in North America.—The value of the iron made in the States was estimated by the census returns at 20 million dollars in 1850, and 28¼ million dollars in 1860, being an increase of 24 per cent. in the ten years.

Coal Production in the United States.—The coal production in the States in 1860 was 15½ million tons, of which 9½ millions was anthracite. Of bituminous coal Pennsylvania produced 45·8 per cent. of the quantity, and 38 per cent. of the value of the whole; of all kinds of coal, 75·3 per cent. of the whole.

California Silk.—The soil and climate of California are admirably adapted to the growth of the mulberry-tree in all its desirable varieties, to the breeding and feeding of the silkworm, and to the production of silk, more so than almost any European country, owing to the fertility of the soil and dryness of the climate, giving a peculiarly rich and nutritive character to the leaves of the mulberry tree, which imparts a higher, finer, and more delicate quality to the silk produced from them. Certificates from the highest authorities in Europe show that the California silk, after being tested, carefully analysed, and compared with European silk, proves to be of the very best quality.

Imperial Tokay.—The village of Tokay, which gives its name to the wine, is situated in Hungary, on the top of a hill, at the confluence of the rivers Rodrog and Theiss. The vineyards occupy a space of ten square miles. The earth is of yellow chalk, mixed with large pebbles. The wine is white, and the vintage is commenced as late in the year as possible, but generally at the end of October. There are four different kinds of Tokay. The first is made by placing the sound grapes in a wooden vat with a double bottom, the one on which the grapes rest being pierced with small holes. The vat is filled with grapes, and covered with boards. After a few hours, the grapes become heated to 80° Fahrenheit, and fermentation begins. This destroys the tartaric acid, and the weight of the grapes forces the juice through the holes at the bottom. The grapes are then trodden by foot, and the wine is poured into small casks, wherein, after having fermented for two days, it is exposed to the air for a month. This is the wine that is generally exported. When of good quality it has a silvery, oily colour. The taste is sweet and mellow, with a peculiar earthy flavour, slightly astringent and aromatic, with good body, but it is not drinkable until it is three years old. The Emperor of Russia has an agent who purchases 40 or 50 casks every year.

Colonies.

South Australian Copper.—The rapid progress of the Wallaroo mineral district furnishes the strongest arguments that can be desired with regard to the expediency of extending all possible encouragement to mining enterprise. It seems but yesterday that the whole country (now dotted with flourishing townships and supporting a population of thousands) was a waste and tenantless scrub, and the question that generally forces itself upon the mind is why should there not be a score of Moontas and Wallaroos developed. It is notorious that indications of copper abound in every direction, nor is it reasonable to suppose that the indications are all delusive. Perhaps no form of colonial industry is so generally beneficial as copper mining. A vast amount of labour must necessarily be employed, and the market thus created for every description of colonial produce is of immense importance to the farmer, stock-owner, and to the commercial public generally. There should be no restrictions, no difficulties, no impediments whatever. Every man should be free to search for copper, and any rental or other charge the state may think fit to exact should follow and not precede that search. If the prospector finds nothing the State should take nothing, and the most thoroughly liberal arrangements should be framed with a view to facilitate and encourage a description of enterprise of such unequalled benefit to the community. The total population of the Wallaroo district, so late an uninhabited desert, cannot be less than from 6,000 to 6,500 souls, as follows:—Kadina and Wallaroo miners, 2,200; Wallaroo, 2,000; Moonta and Moonta mines, 2,000; woodcutters, carters, and others living in the bush, 300; making a total of 6,500 souls.

Phormium Tenax (South Australia).—Large quantities of this plant have been found growing on the mallee scrub of the Lachlan Plains. The flax is from three to four feet high, and from one to two inches broad. It is stronger in its fibre than the New Zealand plant, and seems to be exempt from those oily properties that render the latter so difficult to convert into useful purposes. It is believed that by the aid of the small steamers running up the rivers the South Australian settlers will be enabled to collect vast quantities of the article and send it up to Melbourne. Some specimens have already been forwarded for the purpose of being tested.

South Australia.—The great extent of the work yet to be accomplished in exploring the northern interior is shown by the frequency with which startling rumours relative to that part of the continent are received in Adelaide. Recently, much interest was excited by the report that a stockman in the employ of Messrs. Levi and Co. had discovered a large river flowing from a north-easterly district into Lake Eyre, a report which leads one to hope that the greatest problem of Australian geography has been solved, and that a question of the vast interior basin or inland sea in the north of Lake Torrens may at length be set at rest.

Obituary.

The Earl of Carlisle died, at his ancestral seat, Castle Howard, Yorkshire, on the 5th instant, after a protracted illness. He was the eldest son of George, sixth earl, by the Lady Georgiana Dorothy Cavendish, eldest daughter of William, fifth Duke of Devonshire. He was born in April, 1802, and educated at Eton, and Christchurch, Oxford, where he obtained both the Chancellor's prize for Latin verse, and the Newdigate prize for English verse, taking his B.A. degree in the highest honours. At an early age he entered Parliament as member for the borough of Morpeth, which furnished his own courtesy title. From 1830 till 1841 he sat as one of the representatives of the important constituency of the West Riding of Yorkshire. In October, 1848, he was removed to the House of Peers by the death of his father. Whilst holding a seat in the House of Commons, his lordship filled the office of Chief Secretary for Ireland from 1835 to 1841, under the Lord-Lieutenancy of the Marquis of Normanby and his successor, during a period of great excitement and difficulty; and it was whilst holding this office that he acquired that experience and popularity which rendered him afterwards so well qualified for the discharge of the viceregal functions. From 1846 to 1850 he was Chief Commissioner of Woods and Forests, and from the latter date to 1852, Chancellor of the Duchy of Lancaster. With the exception of the period of Lord Derby's second brief administration in 1858–59, the Earl of Carlisle held the Lord-Lieutenancy of Ireland from the month of March 1855, down to his retirement in September, 1864; a term almost unexampled in its duration. In that capacity he devoted much labour and pains to the development of the agricultural resources of Ireland, and to the spread of a general system of liberal and enlightened education. The noble Earl was the author of several works, of some reputation, the best of which are his "Diary in Turkish and Greek Waters," "Lectures and Addresses in Aid of Popular Education," and "A Lecture on Travels in the United States of

North America." Only a few months ago he presided over the proceedings at Stratford-upon-Avon, in commemoration of the tercentenary celebration of William Shakespeare. His lordship was elected a member of the Society of Arts in 1851, and served the office of Vice-President.

Publications Issued.

Picture Buyers and Amateurs' Guide, Theoretical and Practical, by Théodore Lejeune. (Paris: Benouard, three vols. 8vo.)—This useful and important work is the result of the long labour of a gentleman whose position and reputation give it special claims to attention. M. Lejeune is a painter, entrusted with the delicate duty of restoring the pictures in the Imperial galleries, public and private; and he is also conservator of the collections, amongst others, Duchâtel, Benoît, Fould, and Mornay-Soult. The object of the work, to quote M. Lejeune's own words, is to supply an exact classification of all true masters, in every style and of every school, together with an enumeration of their copyists and imitators, in order to assist amateurs in their researches. The first two volumes only have yet appeared; they contain an enormous amount of information, compiled by the hand of a master. The early chapters treat of general matters, such as the principles of the art, and its technology, the methods of recognizing copies, the fabrication of false pictures, the means employed for fixing the artistic and commercial value of pictures, and the various systems of restoration and cleaning in use; and, upon these points, the long experience of M. Lejeune, and the judicious and impartial tone of his remarks, render him an admirable teacher. In the body of the work the various schools are treated separately, and short, judicious appreciations given of each master, together with a list of his works, whether in public or private galleries, and the prices which they have fetched from the earliest known sales to the present time. The long lists of private collections in England evince the industry which M. Lejeune employed when visiting our country, the whole being furnished with an elaborate index of great importance. The third volume will include, amongst other matter, a Dictionary of Monograms, with fac-similes of a large number discovered or corrected by the author himself.

History of Inventors and Inventions. By Emile With, C.E. (Paris.)—The object of this little work is to inform inventors of what has been done, and to help them, if possible, to avoid wasting their time, energies, and money, in going over ground that has been beaten before. M. With has also his peculiar theories about the methods of assisting inventive spirits and rendering their inventions fruitful.

Observations Made at the Observatory of Paris during the Year 1863.—Such is the title of a publication just issued by M. Le Verrier, the Imperial Astronomer; it contains only the results of observations, their discussion being reserved for the *Annales* of the Observatory. It appears that the number of fundamental stars now registered amounts only to about 600. Great improvements are being made, not only in the means of observation, but also in the relations between the observatories of various countries; an agreement, for instance, has been made between M. Le Verrier and Professor Airy that the results of the labours of each shall be recorded in the publications of the other. The French *Bulletin Météorologique* has in the same spirit been re-named the *Bulletin International*.

Forthcoming Publications.

Les Bijoux et les Gemmes de la Collection du Louvre.—Etched by Jules Jacquemart, with explanatory letter-press, by Henri Barbet de Jouy, Conservator of the Musée des Souverains, and of the middle age and renaissance collections in the Louvre. The first portion of this interesting and important work will appear in February or March next. Everyone acquainted with the Louvre during the last ten years, will remember the little dark room in which were kept the vases in agate, rock crystal, jasper, sardonyx, lapis lazuli, and other stones; the chased and jewelled vases, cups, swords, and other curiosities which had been the property of the kings or queens of France, from the time of Childeric to that of Marie de Medicis. Two years ago this splendid collection was disinterred from the vault-like chamber, and arranged with the contents of the two above-named departments, the cups, vases, enamels, and other objects being admirably arranged in the magnificent Gallerie d'Apollon, which, for many years, had served no other purpose than that of a passage to the great picture-gallery. Here the beautiful works of the great artists of the Italian period, and the curious productions of their imitators, are seen to great advantage, and form one of the finest collections of the kind in Europe. Monsieur Barbet de Jouy, the keeper of this portion of the collections in the Louvre, is now engaged in the production of a catalogue of the contents of these galleries, which will shortly be ready. The forthcoming work, to which this notice alludes, will be no catalogue, but a collection of etchings, representing about one hundred of the rarest or most beautiful objects in the two collections—arms, vases, crystal cups, coffers, reliquaries and ornaments illustrative of industrial art from the earliest days of the French monarchy to the time of Louis the XIV. inclusive, each plate being accompanied by historical and technical notes. The latter will be from the pen of M. Barbet de Jouy, whose reputation and position give them special value; and the former are the work of M. Jules Jacquemart, one of the most able of the French *aquafortistes*. This young artist has already achieved a high reputation by his illustrations of his father's work, "The History of Porcelain;" of the elegant publication of the house of Techner and Co., of Paris, "The History of Bookbinding;" and by some charming fugitive productions of various kinds. We have been favoured with a sight of the plates already executed, and of the drawings for others, and we have certainly never seen more brilliant effects in black and white than those which M. Jacquemart has succeeded in producing in his reproduction of some of the crystal objects submitted to his pencil. Colour is not amongst the means employed, and therefore the etchings in question cannot supply the million with representations, *fac-similes* of the curious objects in question, but the artistic eye will revel in these etchings, which not only reflect the spirit of the great artist workmen of the middle ages, but fix on the plate the beautiful effects of light playing on surfaces of the most complicated outline in an extraordinary manner. The first part of this work, which will consist of three livraisons, will contain thirty-two plates, and as many sheets of descriptive history, and will include, amongst other subjects:—the sword of Childeric, with the crystal ball which accompanies it, and which is supposed to have been used by the Merovingian monarch, as eastern potentates still use similar balls, to produce a pleasant sensation of coolness to the hand; the vases of St. Louis; the sword of Charlemagne; the vase of Aliénor, queen of Louis VII.; the agrafe of the royal mantle of Saint Louis, an immense diamond-shaped clasp or brooch, weighing at least two pounds, and decorated with precious stones apparently of great value; and several other interesting objects. An attempt to delineate gold, silver, and gems by means of the etching point, seems, at first sight, as hopeless as painting the rainbow in Indian ink, but for all purposes of art, M. Jacquemart's etchings are true and admirably effective; as a French critic said of our Turner, "he has tried to paint *light* and has very nearly succeeded."

Notes.

KILLING ANIMALS WITHOUT PAIN.—Dr. Mac Cormac, of Belfast, writing to the *Northern Whig* on the painless extinction of life in animals designed for human food, proposes carbonic acid gas as a suitable agent for this purpose. His method would be extremely simple, and certainly would be an immense improvement on our present practices, which are still as barbarous as they were in the darkest ages. A carbonic acid gas generator of suitable dimensions, fed with a little chalk and sulphuric acid, must be had to hand. The sort of generator made use of by the soda water manufacturers would answer every purpose, even on the largest scale. The gas might be conducted by a pipe or duct into a wooden reservoir or chamber, for carbonic acid gas is so much heavier than air, where the animals should be led. Even gas mixed with air would suffice. No sooner should the line of the gas rise above the level of the zone of respiration than as in the case of the *Grotto del Cane*, or the brewer's vat, the animal would at once fall prostrate and insensible, and, without experiencing any appreciable pain or suffering, expire. A sort of India-rubber hood or bag could otherwise be adjusted to the creature's head, and, when so adjusted, the gas might be led on by a treddle pressed by the operator's foot. The instant the gas should surround the respiratory outlets, the animal's consciousness would cease. In order to prevent reanimation, the creature would have to be left a few minutes untouched, after which the butcher might resume his functions. Some persons may, perhaps, entertain an objection to the flesh of animals that have not been bled. But the abstraction of the blood, if desired, may as readily be effected after death by this process as when it is taken away in the usual manner. But the doctor strongly urges the discontinuance of the blood loss altogether. The butchers' prejudice about well-bled meat is one which they have imbibed from their superiors, and has no colour of support, Dr. Mac Cormac maintains, whether in reason or fact.

PAROCHIAL INDUSTRIAL EXHIBITION.—The clergyman of Amberley, near Stroud, the Rev. R. Edward Blackwell, is actively engaged in getting up an industrial exhibition among his parishioners, and he explains his scheme in a letter addressed to them, from which the following extracts are made:—"You all know how many evils and how much unhappiness, idleness, during the hours of a winter evening, too frequently leads to. That person, then, is your friend who will suggest to you any occupation which may amuse you—which may put some money into your purse—which may keep you at home, and which, in many other ways, may indirectly be for your good. Many of you are clever in making certain things; one can do one thing, and one another. If you will only try, you will find that you can do many more things than you think you can. This trying will be very useful to yourself and others, for one person working will soon set another person a-going. My plan, then, is to try and set all of you, men and women, boys and girls, to work in a pleasant way in your own houses, at your odd moments, during this winter, and for you to gain something by it. At some suitable time in the spring I should like to have in our school-room what we may call an 'Industrial Exhibition.' During the winter months I would have you all work for this, according to your own different tastes and powers, one making one thing, and one another. Everything you make will be your own. At the time fixed for the exhibition, I will endeavour to gather together our friends throughout the neighbourhood, and sell for you the things you have made, if you wish them to be sold. I do not promise to sell them, but I will try to do so; if we cannot sell them they will be returned to you. Every article exhibited, I would suggest, should have the name of the maker written upon it, so that your friends will see by whom every article is made. Let me mention certain things which one and another of you can do, or make, and which I have seen you at different times doing and making as I have called in at your houses:—Baskets—all sorts, all sizes, made of anything, for workmen to carry their meals or their tools in, or for anything else. Work in straw, or rush, or willow, or fern, or grass—mats, housemaids' kneelers, flower pots, bee-hives, cradles for babies or dolls, &c. Rustic seats, small and large—garden tables, stands for flowers, &c. Models—any kind, of any thing. Works in wood—picture frames, towel-horses, cap-stands, boxes, knife-trays, washing-stands, wheelbarrows, rough and smooth, large and small, &c. Works in stone, carved ornaments, vases, flower-pots, sun-dial stands, &c. Needlework—all kinds, patchwork quilts, bags, garden bonnets, knitting, netting, knotting, anything. Birds stuffed—collections of insects, &c. Turning—any thing useful, pegs for hats, for door handles, and for tobacco stoppers. Sticks for tying flowers to—bundles, in dozens, of hazel sticks, or neatly split wood, or turned wood. Labels for flowers in dozens; little boys might make these. Odds and ends—bits of cloth made useful, boys' caps, easy slippers, table covers, shoes made somehow and with anything, drawings, children's toys, dolls, small wheel-barrows, fossils collected from quarries and cleaned, glass covers for flowers, collections of different mosses, or winter flowers in pots or dried, &c., &c." He then suggests a committee of parishioners, and goes on to say—"If the committee see many working, and the thing likely to be a success, they would, previous to the exhibition, print a catalogue of the principal articles about to be exhibited, with the names of the makers. In certain cases the committee might lend a few shillings to buy wood, locks, or other things, as might be required, to be repaid when the articles were sold. The exhibition must be strictly confined to persons living in the parish of Amberley, or to those who belong to the Amberley church or schools. Every article exhibited must be made entirely by the person who sends it. Combined with the industrial exhibition, I would suggest that any friends who have objects of interest to exhibit should be requested to lend them for public exhibition on this occasion; the one exhibition would thus add interest and give power to the other. The exhibition to be open two or three mornings and evenings. The Amberley 'Industrial' band will attend, when able. None of the things sold to be removed till the exhibition is over. Such, dear friends, is a rough plan of my scheme. I am sure it would answer, and do good, if you would all, big and little, men and women, only try to do your best. Let everybody make a something, however small or simple. Do not be shy, or hesitate to join our band of workers. Let every person in the parish if possible be an exhibitor, and try and make something which will do him credit. Great moral benefits must result if we endeavour to spend our winter evenings in a profitable way. Let us look upon this effort in this light; let us all remember the end we have in view; let a family work together in common, and it must produce family love and union. The hearts of the fathers will be turned towards their children. If a small sum of money could be raised, we might bestow a few presents on those amongst our poorer friends, where industry and ingenuity had been manifested, and where there had been persevering effort, amidst poverty and difficulty."

Correspondence.

STATUES OF EMINENT MEN.—SIR,—What has the Council done with the Committee on this subject? I hope the Committee is to be re-appointed, and that the following extract from the *Times*, of November 20th, will be read by it. The Thames embankment will afford even a finer sight than a boulevard for an avenue of statues, and I suggest that the council put themselves into communication with the Metropolitan Board of Works:—"It is true that no city in the world has undergone such transformations as Paris for the last ten or twelve years. Streets of portentous length have been cut through masses of masonry, old or new, as they happened to be in the way, laid bare recesses the very existence of which had been almost unknown to the ancients of the other quarters, and penetrated into alleys and winding lanes, the abode of pestilence and crime, and through which light and air had never filtered. Fountains, gardens, and squares stand where only a few years ago no human habitation was seen. This is not enough. What has hitherto been done is but the solid portion of the monument which is meant to perpetuate the memory of Napoleon III.—the mere masonry, the grosser part of the design. Stately mansions have arisen, as if by magic; there is a very wilderness of boulevards; sewers run in all directions underground; squares are planted with trees; and masons, blacksmiths, carpenters, &c., have done their best. The substantial and the useful being now so much advanced the moment is come for the ornamental, and when the mechanic must give way to the artist. People talk of a double road of statues starting from the Place du Trône, traversing the Boulevards and the Champs Elysées, and terminating at the triumphal arch of the Place de l'Etoile; that is, from one extremity of Paris to the other. Those statues, in marble or in bronze, are to reproduce all that was most celebrated in Monarchical, Republican, and Imperial France, so that in this open-air museum the French may see at a glance all that their country has produced of what was glorious in war, in letters, and in the arts; and that the very omnibus drivers and hackney coachmen may read as they run the lives of these worthies."—I am, &c., F. S.

MEETINGS FOR THE ENSUING WEEK.

Mon. ...Society of Arts, 8. Cantor Lectures. Mr. B. Waterhouse Hawkins, "On the Reproduction of Natural Forms by Art and Manufacture." Introductory Lecture.
R. Geographical, 8½. 1. Mr. John Cameron, "On the Islands of Kalatoa and Paloweh, Malay Archipelago." 2. Dr. J. Hector, "Expedition to West Coast of Otago, New Zealand." 3. Mr. Albert Walker, "Journey along the West Coast of Middle Island, New Zealand."

Tues. ...Medical and Chirurgical, 8½.
Civil Engineers, 8. 1. Discussion upon Mr. Taylor's paper "On the River Tees."
Zoological, 9.
Syro-Egyptian, 7½. Mr. S. Sharpe, "On the Ground Plan of the Temple at Jerusalem."
Ethnological, 8. 1. Mr. Laing, "On certain Remains of the Stone Period from Caithness." 2. Professor Huxley, "On the Human Remains collected by Mr. Laing." 3. Mr. John Evans, F.R.S., "On Flint Implements from Salisbury Hill, near Bath."

Wed. ...Society of Arts, 8. Sir Robert Kane, F.R.S., "On the Recent Progress and Present State of Industry in Ireland; and the Dublin International Exhibition of 1865."
Graphic, 8.
Microscopical, 8. Discussion on "The most Advantageous Means of Illuminating Objects under the High Powers of the Microscope."
Literary Fund, 3.
Archæological Assoc., 8½.

Thurs...Royal, 8½.
Antiquaries, 8.
Linnæan, 8. 1. Dr. Kirk, "On the Tsetse-fly of Tropical Africa." 2. Dr. Hooker, "On *Aristolochia*, *Hydnoria*, and *Apodanthes*." 3. Dr. Dickie, "On two forms of *Eriophorum angustifolium*." 4. Professor Oliver, "On *Lentibulariæ*, collected in Angola by Dr. Welwitsch." 5. Prof. Oliver, "On Plants collected in Japan and the Islands of the Korean Archipelago by Mr. R. Oldham."
Numismatic, 7.
R. Society Club, 6.
Chemical, 8. 1. Messrs. Gladstone and Holmes, "Action of Ammonia on Sulphochloride of Phosphorus." 2. Prof. Williamson, "Chemical Nomenclature and Notation."

Fri.......Philological, 8.

Patents.

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From Commissioners of Patents Journal, December 2nd.

Grants of Provisional Protection.

Benzole, treating of—2846—J. J. Moutie.
Bodily injuries, appliances for treating—2842—M. Henry.
Boilers, manufacture of wrought-iron—2834—R. Gardner.
Cages—2812—C. Mohr and S. E. Smith.
Cannon, breech-loading—2153—J. H. Wilson.
Carpets, looms for weaving—2848—P. Lachez.
Cocks and valves—2836—R. Harlow and W. Jolley.
Corn, millstone for grinding—2862—J. Aubin.
Envelopes, mechanism for closing—2820—W. Fisher.
Filter or press—2786—W. E. Newton.
Fire bars—2860—J. Gothard and H. Garland.
Grain, receptacle for storing—2844—A. C. Henderson.
Gun barrels and ordnance—2784—J. Thompson.
Gunpowder, machinery for compressing—2816—D. S. Sutherland.
Hair, apparatus for brushing the—2838—C. L. Oliver.
Hats, &c., manufacture of—2790—R. B. Cooley.
Invoice file—2780—S. Dixon.
Iron and steel, manufacture of—2856—S. C. Kreeft.
Knapsack supporter—2818—G. Davies.
Looms—2850—J. Bullough.
Looms—2804—W. Clark.
Malt liquors as tonics—2821—F. A. Papps.
Manure, manufacture of—2840—J. J. Renous-Cere.
Meat, &c., preserving—2794—J. McCall and B. G. Sloper.
Metals, rolling—2772—A. Bechem and H. Wedekind.
Millstones, apparatus used for feeding—2824—E. F. Woods and J. S. Cocksedge.
Motive power engines—2796—J. Simes.
Moulds for casting—2810—W. E. Gedge.
Night lights, manufacture of—2762—A. Field.
Painting, composition for—2858—M. Destrem.
Paper, manufacture of—2798—L. Cooke.
Photography—2800—W. Willis.
Pins, pointing wires for—2540—O. L. Hopson and H. P. Brooks.
Printer's ink, manufacture of—2854—J. Rowley.
Pumps, apparatus for working ships'—2814—C. W. Heckethorn.
Pumps—2830—W. E. Gedge.
Railway breaks, management of—2618—H. Bird.
Railway trains, communication between passengers and guard—2826—C. Cotton and W. Nunn.
Running shafts, lessening the resistance to the motion of—2843—N. Bailly, C. Durand, G. H. Mesnard, and Z. Poirier.
Saws, sharpening—2793—E. J. W. Parnacott
Sewing machines—2822—J. McCloskey.
Soda, manufacture of—2864—W. E. Newton.
Steering apparatus—2792—M. W. Ruthven.
Substances containing moisture, apparatus for drying—2806—G. Smith.
Sugar, mills for crushing—2802—G. Dixon.
Ventilators, apparatus for cleaning—2009—H. Dyer.

Inventions with Complete Specifications Filed.

Lamps, burning oil in—2939—W. Ryder.
Tanning, process of—2927—F. Pfanhauser.

Patents Sealed.

1387. B. Azulay.
1391. E. Ledger.
1392. J. Smith.
1393. W. T. Cheetham.
1396. H. Hill.
1398. J. Snider, jun.
1400. B. E. M. Crook.
1408. W. Clark.
1409. E. J. Hughes.
1417. J. A. Wade.
1419. A. A. Larmuth.
1428. A. Tweedale.
1431. P. M. Parsons.
1438. N. Sarony.
1455. E. G. Fitton.
1462. R. Kendrick.
1475. M. A. F. Mennons.
1504. R. and L. R. Bodmer.
1508. M. E. Boura.
1645. A. Wyley and J. Grainger.
1692. C. H. Collette.
2364. H. Bennison.
2429. S. Bateman.

From Commissioners of Patents Journal, December 6th.

Patents Sealed.

1414. R. A. Brooman.
1434. J. Onions.
1440. F. Tolhausen.
1441. W. Hugo and A. Domerer.
1442. J. P. Williams and T. Robinson.
1444. R. A. Brooman.
1449. S. Tuchet.
1452. P. and J. B. Spence.
1463. J. G. Marshall.
1520. J. H. Johnson.
1522. S. G. Hewitt.
1548. J. H. Johnson.
1629. R. Balans.
1769. W. K. Westley.
2064. G. Davies.
2246. G. Haseltine.
2396. G. Haseltine.
2397. G. Haseltine.
2569. J. Zeh.

Patents on which the Stamp Duty of £50 has been Paid.

35. H. D. Pochin.
3031. G. T. Bousfield.
3332. J. L. Field.
3033. W. Duchemin.
3025. T. W. G. Treeby.
3066. J. J. Russell and B. L. Brown.
3098. W. E. Newton.
3257. W. E. Newton.
3048. J. Knowelden.
3055. M. Henry.
3069. R. Jolley.
3235. R. Needham.